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A STUDY OF LONGITUDINAL PATTERNS OF FAILURE AMONG HIGH SCHOOL DROP-OUTS AND POORLY PERFORMING GRADUATES.

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THE RELATIONSHIP BETWEEN PATTERNS OF POOR PERFORMANCE AND SIGNIFICANT DISTINGUISHING FACTORS WHICH MIGHT IDENTIFY DROPOUTS IS EXPLORED. DATA WERE OBTAINED ON 270 STUDENTS (FROM A PARENT POPULATION OF 2,500) WHO WERE POOR PERFORMERS (POOR PERFORMANCE BEING DEFINED AS THREE "D'S" OR "F'S" IN HIGH SCHOOL). THE VAST MAJORITY OF THESE POOR PERFORMERS COULD BE IDENTIFIED EARLY IN THEIR ACADEMIC CAREERS. THE AREAS OF CRITICAL PERFORMANCE WERE PRIMARILY IN THE ENGLISH COURSES AND IN MATHEMATICS. AFTER ONSET OF FAILURES DURING THE FIRST 2 YEARS, THERE IS A FAIRLY CONSISTENT DISTRIBUTION OF FAILURES THROUGHOUT THE ACADEMIC CAREERS OF THESE STUDENTS. THROUGH THE YEARS, ENGLISH WAS MOST FREQUENTLY FAILED, WHILE MATH AND SOCIAL STUDIES WERE THE NEXT MOST DIFFICULT AREAS. THE FURTHER ALONG THE POOR PERFORMER'S ACADEMIC CAREER, THE WORSE THE GRADES BECAME. BOYS TENDED TO DROP OUT THROUGH GRADES 10-12, IN CONTRAST TO GIRLS WHO MOST FREQUENTLY LEFT IN THE 12TH GRADE. EARLY PERFORMANCE WAS FOUND TO BE A GOOD INDICATOR OF LATER ACADEMIC DIFFICULTY BUT NOT AS GOOD AN INDICATOR OF A STUDENT'S DROPOUT POTENTIAL. (SK)

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NATIONAL CENTER FOR EDUCATIONAL STATISTICS
Division of Operations Analysis

A STUDY OF LONGITUDINAL PATTERNS OF FAILURE AMONG HIGH SCHOOL DROP-OUTS AND POORLY PERFORMING GRADUATES

Prepared for the Division of Operations Analysis

by

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NATIONAL CENTER FOR EDUCATIONAL STATISTICS
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SUMMARY

It was the purpose of this study to examine two basic questions:
A. Do certain patterns of subject-grade failure interdependencies exist with respect to poor performance among students in elementary and secondary school? This question focused on the quality of educational performance irrespective of whether a particular student graduated or failed to complete his education.

B. Are there certain patterns of performance which distinguish the dropout from his peers, who, despite poor performance, manage to graduate?

Data to answer these general questions were obtained on 270 students (from a parent population of 2, 500) who demonstrated serious academic difficulty (at least two failures and several other low marks) during their high school careers. Data were collected only for students whose records were available back through most of their elementary school careers.

The above two concerns were applied to all of the following questions, which are answered, based upon data presented, in the main report.

With Respect to the Onset of Failure:

1. How early and in what subjects do initial failures occur among students who do poorly later in their academic careers?

Among high school students who do poorly, the vast majority could be identified early in their academic careers. The data indicated that by the end of the second grade, over 50% of those who would do poorly in high school had already had their initial failure; by the fourth grade, 75% had initial failures, and 90% had earned a failing mark by the 7th grade. The areas of critical performance were primarily in the English courses, and in mathematics.

2. What are the dominant patterns of poor performance and what are their origins?

Over 40% of the subjects showed a "spread pattern" indicating that many children will provide early warning signs of future failure by one or two early failures, which are spread later across a number of subject areas. The origin point of spread was heavily concentrated in the English courses. Regarding this question of differences between dropout and graduating student patterns, no significant differences emerged.

With Respect to All Failures Over the Years, Across Subjects:

3. What are the patterns of failure among graduates and dropouts by year?

After onset of failures during the first two years, there is a fairly consistent distribution of failures throughout the academic careers of these students. Two interesting trends were noted. There is a rather gradual climb throughout the school years of the incidence of poor performance, and there is a jump in incidence of failures at the 9th and 10th grade levels. A comparison of dropouts to low-achieving graduates suggests that graduates tend to do somewhat better than dropouts; and the dropouts seemed to fall further and further behind after the 7th grade.

4. What are the patterns of failure among graduates and dropouts by Subject?

Across the years, English was the subject most frequently failed by students. Math and social studies were the next most difficult areas, with Science and languages falling last. While shop and business courses also were areas of failure, these did not give the students as much trouble as did the academic subjects. There was a slightly higher percentage of dropouts with academic difficulty in all or most subjects, than was found among graduates; dropouts from the 7th to the 12th grades had greater difficulty.

5. What are the patterns of failure among graduates and dropouts by subject and by year?

Grades 1 through 3 provided greater difficulty for graduates than for dropouts; this was true in all subjects. However, starting at the 4th grade, and with the exception of the 6th grade, dropouts fell behind graduates and the gap widened over the years. Analysis of the D's and F's

indicated that both groups did progressively more poorly from 7th through 12th grades, but that the trend was most marked for the dropouts. The further along in the dropout's academic career, the worse the grades became. English and Math were key areas.

6. Where in their careers do dropouts leave high school?

There is a fairly constant exodus from grades 10 through 12, but the boys made up the majority of dropouts, and they tended to leave steadily throughout high school (in contrast to girls who dropped out most frequently in the 12th grade).

With Respect to the Interrelationships Among the Courses Failed Over the Years:

7. What are the interrelationships between early elementary school performance and early high school performance?

Reading (an area of high initial failures in the first four grades) showed a significant relationship to failures in both social studies and in Science at the 9th grade level.[1] In addition, early Math failures corresponded significantly to later failure in English. Generally, failure to do well early in one's career was a real liability later, but success in early career did not guarantee future success.

8. What are the interrelationships between midpoint single and multiple course failures at the 7th grade level, and later graduation?

Achievement in English and Math, and in combined English-Social Studies; English-Math; English-Science; and English-Math-Social Studies, all corresponded significantly to future graduation. Inspection of the data indicated that the high level of significance was due to the behavior of the graduates more than of dropouts; i.e., a large number of graduates failed to do poorly in these courses simultaneously. Conversely, only about 50% of the dropouts did poorly in the paired courses. Thus, performance served as a reasonable predictor of later graduation.

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[1] Chi-square test of two-independent samples.

I. INTRODUCTION*

The problems posed to contemporary American society by both high school dropouts and "low quality" high school graduates have been a subject of major national concern. Books,[1] magazines and journals, mass media coverage, and recent congressional action,[2] all indicate growing public awareness and determination to cope effectively with the dropout phenomenon. Cervantes[3] estimates the dropout rate among U.S. high school students to be between 30 and 40 percent. This estimate, if correct, means that more than seven and one-half million students will fail to complete high school in the 1960's; a figure which is both actually and proportionately greater than in the depression years of the 1930's. It does not even consider the problem of students whose performance records are poor, but still manage to graduate.

These dropout statistics are important because of the social and personal problems associated with being a dropout in our society. It is known that crime, drug addiction, high unemployment, illegitimacy, welfare dependency, and alienation from the community exist at a disproportionate segment of this population. Lack of self-esteem and failure to participate in the social and political development of the community are further corollaries. When the direct cost of these problems to the public (police, health, welfare, etc.) is combined with the cost-savings opportunities lost through failure to realize human potential (economic, social, and personal), the impact on society is enormous. While it cannot be argued that dropouts and poor performance cause these future problems, failure to successfully complete high school inevitably interacts with the critical factors which caused the dropout in the first place. Thus, it seems reasonable to assume that reversal of this trend could have many desirable consequences.

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*The study was conducted as part of a contract between Abt Associates Inc. and the U.S. Office of Education (#OEC 1-6-001681-1681).

[1] Excellent research and discussion of these problems may be found in: Cervantes, . . . The Dropout, Ann Arbor, University of Michigan Press, 1965; Schreiber, D., The School Dropout, Washington, D.C., National Education Association, 1963-64.

[2] The Elementary and Secondary Education Act of 1965.

[3] Op Cit.

II. STATEMENT OF PROBLEM

This study was undertaken as a part of a contract with the U.S. Office of Education to develop a computer planning model for estimating the relative cost-effectiveness of alternate Title One programs placed in specific communities. It is assumed that different communities (possessing different socio-economic characteristics), while frequently having similar problems or symptoms are in need of different types of programs; since the causes of their problems are different, the solutions may be different. A computer model, serving as a planning aid, must be able to integrate critical descriptors of a community, its school system, and the instructional process on the one hand, with various programs (e.g., remedial reading, counselling, vocational training, new facilities) on the other. Such bringing together of data, if well programmed, will suggest probable outcomes, both qualitatively (better students, better community, etc.) and quantitatively (more graduates, more jobs, etc.). In order to make predictions about both the quality of graduates, and the number of graduates (as opposed to dropouts), it is necessary to obtain actual records of student performance from which initial computer weightings can be determined. Future experience with the consequences of Title One programs will provide refinement and validation of such weightings.

This study sought to determine quantitatively the relationship of variables in two areas:

1. Do certain patterns exist with respect to poor performance in elementary and secondary school? A basic concern is the subject-grade interdependence. This question focuses on the quality of education, regardless of whether a particular student graduates or fails to complete his education. The question also implies that certain early patterns of failure have "downstream" effects which can be analyzed and from which probability indices can be derived. Such effects may be subject-specific, or fall into stages (e.g., 7th grade, 9th grade, etc.).

2. Are there certain patterns of performance which distinguish the dropout from his peers who, despite poor performance, manage to graduate? Here, it is recognized that while external conditions may be an important factor in dropping out of school, that dropouts may also show different academic patterns corresponding to their ultimate failure to complete school. Cervantes lists 20 characteristics which correspond to dropping out of school. These are broken down into the areas of School, Family, Peer, and Psychological Test indices. The present study is concerned mainly with the school factors. Cervantes notes that by the 7th grade, there is a depressed performance in math and reading (by 2 years); the majority of letter grades are poor; many have failed at least one grade in school; attendance is poor; students are frequently "under achievers;" there are frequent changes in school and many behavior problems. These are all acknowledged as being important, but the authors feel that it would be interesting to know more about both patterns of failure, and factors which distinguish the dropout from his peers who performed poorly, but still managed to graduate.

Quantitative analysis of data on students regarding the above two question areas (covering their elementary and secondary school careers)[4] can provide the basis for initial predictions of the consequences of new educational programs.

Keeping in mind the above two considerations (patterns of poor performance and significant distinguishing factors which might identify dropouts) the following questions were of primary importance.

A. With Respect to the Onset of Initial Failures:

1. How early and in what subjects do initial failures occur among students who do poorly later in their academic careers?

2. What are the dominant patterns of failure in terms of grade of onset, and by subject of origin?

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[4]It has long been recognized that one characteristic of the high school dropout is a history of poor performance, probably beginning early in elementary schools. While common sense suggests that there would be numerous published studies of individual student differences over the years, such has not been the case. In part, this may be due to the diversity of student populations in this country, and to different school policies, community characteristics, and different course curricula. It is also possible that a number of studies have been conducted which did not yield significant results and as a consequence were not published. To date, the best analysis of longitudinal research known to the authors has been developed by Bloom, B., Stability and Change in Human Characteristics, New York, Wiley, 1965.

III. COLLECTION OF DATA

The data collected for this study were obtained in a suburban New England community of approximately 90,000 people. The median family income is $9,000. Students who are in attendance in the public school system come predominantly from middle to upper middle-class homes, with a limited segment (perhaps 5%) coming from relatively disadvantaged families (as defined by ethnicity, family education level, and income). Elementary schools serve the first six grades; junior high schools serve the 6th through the 9th grades; and the high school, grades 10-12. The majority of students attending the public high schools go on for further education.

Data were collected on a total of 270 students, drawn from a parent population of approximately 2,500 students in attendance in the high school who graduated (or were scheduled to graduate) during the years 1966, 1965, 1964, and in a few cases, 1963. All students in this sample had attended high school at least long enough to have a record (entered upon the student's beginning studies at the school). The basic criterion of inclusion in the sample was serious performance difficulty during high school attendance or dropping out of school. Poor performance was defined as earning at least 3 "D's" or "F's" during high school career. Where students had only one or two failures, the grades were considered as "incidental" failures, and were not included. Furthermore, data were gathered only for Students with histories which could be traced back through early elementary school. The 270 subjects in the sample included all students who classified as poor performers, and for whom records were available back through early elementary school.

A common problem in analyzing data of this type is the "self-selective" nature of the sample, i.e., the very students of greatest interest to the study are those most likely to have incomplete or sketchy records due to moving around from one school to another, dropping back a grade, dropping out of school, etc. In contrast, students who may serve as comparison groups tend to be more stable in these respects. In essence, the selection factor makes generalization somewhat more difficult. Certain shortcomings in the data

were noted and served to place constraints on the generalizations drawn following analysis of data.[5]

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[5]Limitations in generalization of results were imposed by the following considerations:

1. Students who performed poorly in early years of school, but who managed to improve their performance by high school were not included in this study. Thus, there is no way to analyze the differences in performance patterns of students who remained as poor performers, , in contrast to those who improved. Data collected in another survey by Abt Associates Inc. on achievement tests in Iowa suggest that students who initially perform poorly, and then improve markedly in later years are in the minority.

2. Students who performed poorly in high school, but whose records had incomplete data for earlier years were not included. We have no reason to believe that they would have records "worse" than those included in the actual sample.

3. In some cases, students classified as "dropouts" may have completed their course work later and elsewhere without informing school officials. This is considered to be unlikely in most cases, however, since requests for records are necessary in cases of transfer and this is noted in the school records.

4. There is a tendency for high school students doing poorly to take less course work in the academic areas. Therefore, it was not assumed that the proportion of student failing English could be taken as comparable data to the proportion of student failing Science (since the actual number of enrolees was different).

5. Finally, the data of elementary school records presented some problems. Many student records for elementary school had only limited data in the first through third grades (and in many cases, data were totally absent). In addition, grade school teachers seemed to be less likely to differentiate performance abilities than were teachers in later grades. Grading was also done on a more objective basis in later than in earlier school years. Furthermore, while English and Math had an "objective" scoring system for grades 1-3, the same was not true of Science and Social Studies. Because of these problems, considerable care has been taken in drawing conclusions about the exact nature of failure problems in the first and second grades.

IV. ANALYSIS OF DATA

How early and in what subjects do initial failures occur among students who do poorly later in their academic careers?[6]

The uncorrected distribution of incidents of initial failure (a conservative measure) showed clearly, that among high school students who did poorly, the vast majority could have been identified early in their academic careers (see Table 1). Of these students, three out of four had already demonstrated poor performance in the 4th grade; by the 5th grade almost four out of five had indicated trouble in their studies; and by the 7th grade, nine out of ten had performed poorly. The table indicates that by the time students pass through junior high school, ninety-seven out of one hundred students who will receive low marks will have had a previous record of failure. Clearly, among high school students who do poorly, the vast majority could be identified early in their academic careers (in elementary or junior high school).

The limitation of data for the 1st and 2nd grades means that if anything, these estimates are conservative. In order to correct this distortion the sample population was divided into subsamples by incidence of first year of data for grades 1 through 5. For each subsample, the "adjusted" first failure data were assumed to begin the year after the data actually started. From the "adjusted" data cells, mean first failure occurrences and their standard deviation were determined. These figures were used to establish a probable range of first failure occurrences for the students for whom data were not available. In grades 1 and 2 the number of occurrences was approximated using the grade 1 to grade 2 proportion from the more limited sample for which we had data. Not surprisingly, the adjustment did not change the cumulative percentage for the first four grades; i.e., a total of 75% of the sample shows initial failures by the end of their fourth year. However, the adjustment does

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[6] In answering this important question, the data presented certain problems. First, subjective evaluations by individual teachers made it difficult in many cases to categorize a student's first or second grade performance; second, data were frequently spotty or absent for the first or second year. To deal with these problems, two forms of analysis were utilized. First, the actual number of failure incidents for every grade was recorded without respect to the data limitations (with the recognition that all records would probably be included by the fourth grade). Following this, the probable distribution of failures was then determined for the earlier grades among students whose first and second grade data were unclear or absent.

Table 1

Point of first failure/s, by subject and year in school, for 270 poorly performing high school students

SUBJECT	YEAR IN SCHOOL											
	1	2	3	4	5	6	7	8	9	10	11	
	S M[1]	S M	S M	S M	S M	S M	S M	S M	S M	S M	S M	
ENGLISH												
Reading	7 10	7 42	5 22	2 17	1 5	3	3 6		1 2	1 5		
Oral/Written	3 7	5 22	2 26	2 19	4	1 1			1			
Spelling	5	4 34	3 20	4 15	1 4	3	1 2	2 4	2 4	3		
MATHEMATICS	2 8	6 26	3 11	7 15	1 4	1 4	2 9	5	1	4		
SCIENCE	3	1 2	6	6	2	1 5	1 5	1 4	1	2	1	
SOCIAL STUDIES	1	2	10	11	3 2	1 4	2 6	2 5	1 1	4		
MISCELLANEOUS							3	1 1	1		1	
TOTAL SINGLE (78)	13	23	13	20	6	4	10	6	3	1		
Cumulative Percent	13%	36%	49%	65%	71%	75%	88%	94%	99%	100%		
TOTAL MULTIPLE (258)	33	29	93	83	21	20	28	19	10	18	2	
Cumulative Percent[2]	7%	35%	56%	74%	78%	83%	89%	94%	95%	99%	100%	
CUMULATIVE FAILURES M&S Corrected for Data 1-4[3]	33%	53%	61%	75%								

[1] S = Single initial failure; M = multiple initial failures

[2] It is assumed that the number of initial multiple failures, by student, is roughly comparable across the years. Thus, the cumulative percentages represent the incidents of failures rather than the percentage of subjects.

[3] See text discussion of "adjusted" failure incidence.

indicate that grades 3 and 4 are too heavily biased in the unadjusted data to give the true year-by-year picture. The adjusted data (see Table 1) indicate that in fact slightly over 50% of the total initial failures have appeared by the end of the second grade (while the unadjusted data indicate that this point is not attained until midway through the third grade!). This adjustment strengthens the case that performance difficulties appear very early in the school career.

It is important to note the subject areas which provided the greatest difficulties. The critical performance difficulties fell in the English areas (Reading, Oral and Written Usage, and Spelling, in that order) and in mathematics. These findings are somewhat biased, for teachers do not give letter grades to the Sciences and Social Studies until the 4th grade. However, these latter two subjects fail to show up as important areas of initial failure at any point (even beyond the 3rd grade where objective grade scoring is available). Although these subjects were not the source of initial difficulty, this should not be confused with an absence of failures in these subjects. Many students did poorly in Social Studies and Sciences, but they were not their areas of initial failure. This distinction will be discussed later in the paper, in sections dealing with "downstream effects" of early failures.

The raw data were further analyzed to determine if the percentage of onset of failures differed for graduates and dropouts. The data revealed a clear, but limited, difference between these two groups. In 21 out of 24 cells (the first four grades for six subject areas) graduates exceeded dropouts in the proportion of initial failures recorded. Dropouts as a group tended to begin failing subjects somewhat later in their academic careers than poorly performing graduates. It should be remembered that "graduates" refers to students who completed school with very poor performance records; not to the entire student body. This finding is important, and will be dealt with further in the discussion of results.

What are the dominant patterns of failure in terms of grade of onset, and by subject of origin?

It is reasonable to assume that not all children "fail" in the same manner. Some will start to fail early in their careers, others will have

fail until later on. Some will begin having difficulty in only English, others in Math, and still others will begin experiencing difficulty in a number of areas simultaneously. Furthermore, some will begin with many failures and impr ove themselves; others will have only limited failure in elementary school, but later have trouble in all of their work.

Because of such individual differences, it was hypothesized that over a large sample of subjects, various "patterns" of failure emerge. These included:

> Spread Patterns: Early poor performance in one or two areas, which later expanded to include other subjects, (i. e. the long shadow of achievement gaps.)
>
> Parallel Patterns: A pattern of failure which begins in three or more areas and continues in those areas.
>
> Hour-glass Patterns: Early failure in three or more areas followed by improvement and then return to failures in many areas.
>
> Late Failing Patterns: Onset of failure does not occur until the 6th grade.
>
> Random Patterns: No apparent pattern.

It will be noted that no "converging" pattern of reduced failures is included. This is because such students, by virtue of the selection procedure, are excluded from the sample.

Data separated into these five categories (which contrasted dropouts to graduates) yielded the following distribution:

Table 2

Analysis of Poor Performance According to Pattern of Failure*

	Pattern	TOTAL No.	%	Dropouts No.	%	Graduates No.	%
1.	Spread	108	(40)	29	(40)	79	(40)
2.	Parallel	48	(18)	10	(14)	38	(19)
3.	Hour-glass	20	(7)	5	(7)	15	(08)
4.	Late Failing	57	(21)	18	(25)	39	(20)
5.	Random or incomplete	37	(13)	10	(14)	27	(14)

*N = 270

Of the 270 records analyzed, 108 were found to have a spread pattern of poor performance. Collectively, this represents 40% of the total sample, the largest single grouping. It is felt that this spread pattern is particularly significant, since the parallel and hour-glass patterns show multiple failings and provide clear-cut warnings for the need for some type of intervention. This finding that many children start out with failures in one or two areas and later fail in other subjects suggests that these limited failure patterns be used as "early warning signs."[7]

With this in mind, the data were then examined to determine the areas which most typically were the origin points of the spread pattern. Analysis of the origins of both single and double area spread patterns provided strong evidence that English, and particularly, Reading, was the most frequent origin of failures. This is consistent with the data regarding the general onset of failure. Beyond English, only Mathematics showed any sign of being an important indicator of future spread, and this usually when in combination with English. The data demonstrated that by the 3rd grade, two-thirds of the students who would have developed spread patterns in future years, had developed them, and these had their origins in the English subgroups.[8]

Examination of the distribution suggests no interesting differences between the patterns of dropouts as opposed to poorly performing students who ultimately graduated.

What are the patterns of failure among graduates and dropouts by year?

Up to this point, we have described the patterns of onset of failure. Now the focus shifts to occurrence of all failures. The total number of failures, when corrected for intermittent data in the first two years, and

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[7] It is recognized that there may be a number of children who do poorly in one or two areas, but then pull themselves up (who would be absent from this sample). However, they also would probably benefit from additional assistance.

[8] Specifically, English accounted for almost 70% of the single origin spreads (with math making up the remainder), and regarding double area initial failures, English was involved in every case. Reading in combination with other subjects was the most significant origin point of spread.

for the dropout occurrences in the last three years, do not suggest any significant "high-points of failure," as for example, junior high school or high school. The occurrence of failure seems to start early and rise rapidly, and then increase slowly over the years (the increase for dropouts being more than that of the graduates). There is a slight rise in the percentage (to 13%) in grades 9 and 10, which may be a function of a broader range of individual differences and/or more stringent grading, but this seems only moderately interesting. With regard to a comparison of dropouts to graduates, however, there seemed to be a greater proportion of poor performance in the 9th and 10th grades, suggesting that as they come closer to dropping out of school, they drop further in their performance.

Table 3

Distribution of Failures by Year for Graduates & Dropouts*

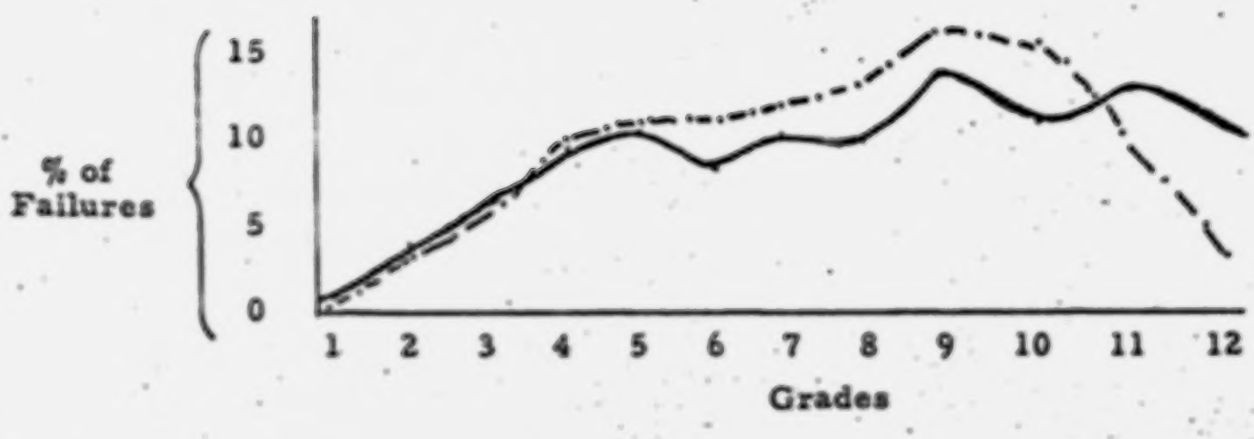
Grade	Percent of Poor Performance Graduates		Dropouts		TOTAL
1	.7	(2.8)**	.1	(4.5)	.8
2	3.6	(5.7)	3.3	(5.5)	3.5
3	6.2	(7.5)	5.7	(6.4)	6.0
4	9.2		9.7		9.3
5	10.2		10.7		9.8
6	7.4		9.7		10.1
7	9.3		10.2		8.2
8	9.3		11.1		9.8
9	12.4		13.7		12.8
10	10.5		13.4		11.3
11	11.8		8.2		10.8
12	9.3		3.2		7.6
	99.9		99.0		100%

*N = 270.

**Approximations based on a full sample size population hypothesized for the first three grades.

Table 3A

Distribution of Failures for Graduates and Dropouts



Graduates = ———

Dropouts = — · —

One of the problems of examining patterns across years is that in combining all subject areas together, differences which may exist among the academic subjects are concealed. A comparison of dropouts to graduates suggests that year-by-year, the graduates do relatively better than the dropouts; that dropouts, starting at about the 4th grade, do progressively worse each year. This will be further analyzed under the section dealing with subjects, by year, by graduate status comparison.

C. What are the patterns of failure among graduates and dropouts by subject?

How many of the total failures earned over all years fell into which subject areas? Analysis of the data showed that English was by far the most significant area with almost 30% of the total failures. Mathematics and Social Studies each accounted for 18% of the failures. Languages (15%) and science (13%) made up the other important areas. Notably, shop and business, even though started in the 7th grade (rather than in the 1st), still did not show many failures in this sample. Thus, despite the fact that many of these students were not "college bound," the academic areas still dominated their failure areas. Generally, the problem areas of dropouts as contrasted with graduates were similar. The general finding is

that pupils with poor performance records have the greatest difficulty with English, and that they seem to fail other academic subjects somewhat uniformly.

While the distribution of failures for graduates and dropouts across subjects was similar, dropouts tended to perform more poorly than graduates in each subject. This was particularly true later in their academic career, starting clearly after the 6th grade.

D. What are the patterns of failure among graduates and dropouts by subject and year?

Tables 4 through 7 present a year-by-year analysis of the performance patterns for graduates and dropouts, for English, Mathematics, Science and Social Studies. For grades 1 through 3, in Science and Social Studies, the pattern is very similar. There is no marked difference between dropouts and graduates (possibly due both to the lack of objective marks and low incidence of failure). However, Mathematics and English each present a unique distribution pattern. Generally, the graduates receive a higher percentage of low marks than the dropouts. Both populations, however, show an increasing trend.

In grades 4 through 6, the percentages diverge, with the dropouts having a greater number of failures in every subject. This difference is lost at the 6th grade, and it is at this point, that the graduates tend to level off somewhat, while the dropouts begin to progressively increase in their number of failures. In every subject (except Math, 10-12) from grades 7 through 12, the graduates have a substantially lower percentage of poor marks over the last five years. It is clear that the differences, while not large, consistently favor the graduates in terms of better performance.

Two more specific analyses of these data were possible. First, are there significant differences among the various subgroupings of courses for the first three years? Second, are there differences in the F to D mark ratios of the two groups for the last seven years? With respect to the first three grades, there were no significant differences between graduates as compared and dropouts in the subgroups of English (Spelling, Reading, or Oral and Written Usage), nor in the various

combinations of English, Math, Social Studies and Science. Finally, analysis of the ratio of D's and F's for dropouts versus graduates, indicated that there is no noticable difference in patterns. Both patterns show a gradually increasing percentage of F's, with the dropouts having a greater slope. The percentage exceeds 50% in only five cases. However, in terms of the actual ratio of D's to F's, dropouts do have a larger percentage of F's than graduates. This was particularly true in the last two years, perhaps due to the ever-diminishing number of dropouts (mostly girls) by the 12th grade.

Table 4

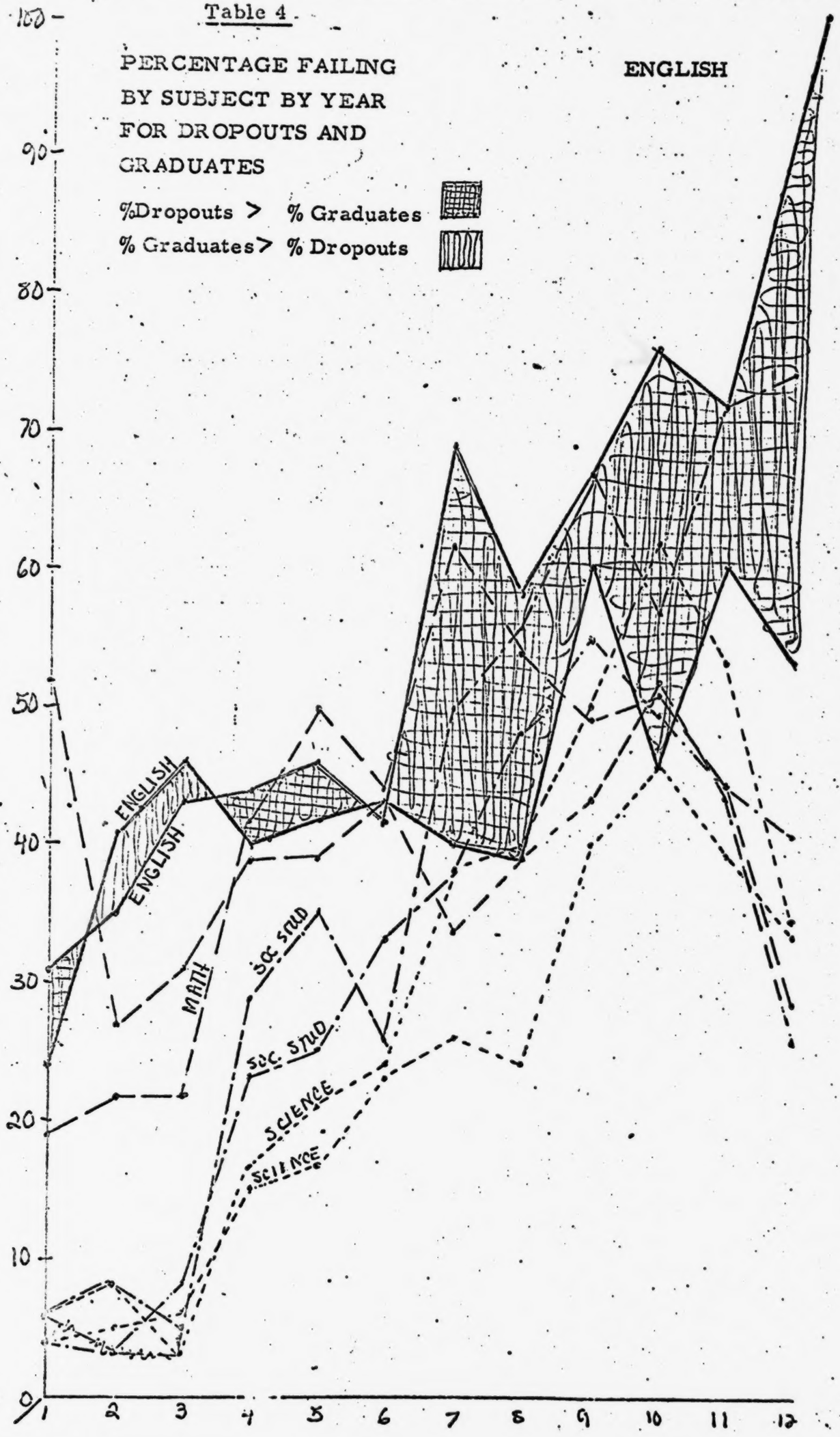

PERCENTAGE FAILING BY SUBJECT BY YEAR FOR DROPOUTS AND GRADUATES
%Dropouts > % Graduates
% Graduates > % Dropouts
ENGLISH
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
ENGLISH
ENGLISH
MATH
SOC STUD
SOC STUD
SCIENCE
SCIENCE

Table 5

PERCENTAGE FAILING BY SUBJECT BY YEAR FOR DROPOUTS AND GRADUATES

MATH

% Dropouts > % Graduates

% Graduates > % Dropouts

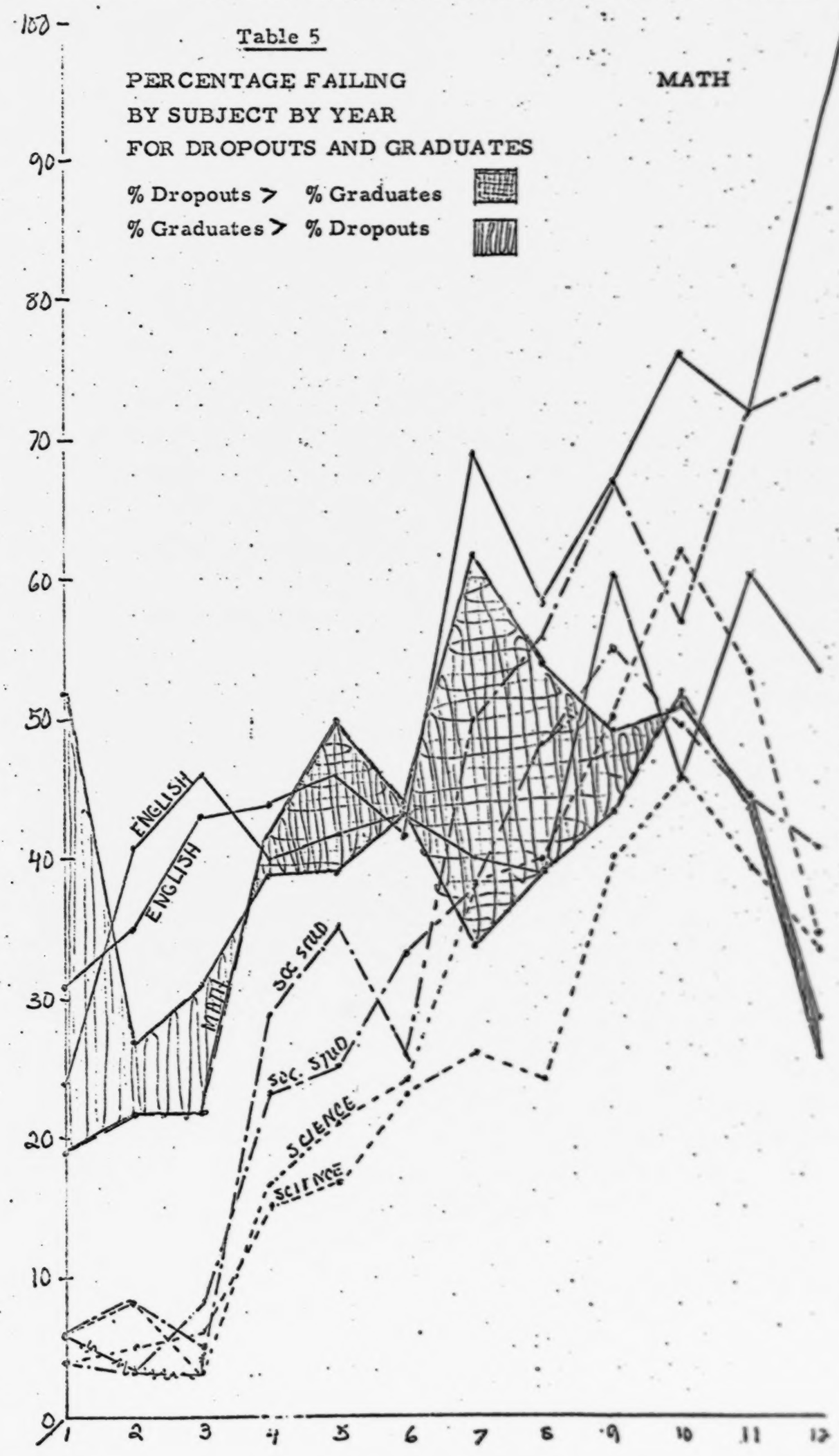


Table 6

PERCENTAGE FAILING BY SUBJECT BY YEAR FOR DROPOUTS AND GRADUATES

SCIENCE

% Dropouts > % Graduates

% Graduates > % Dropouts

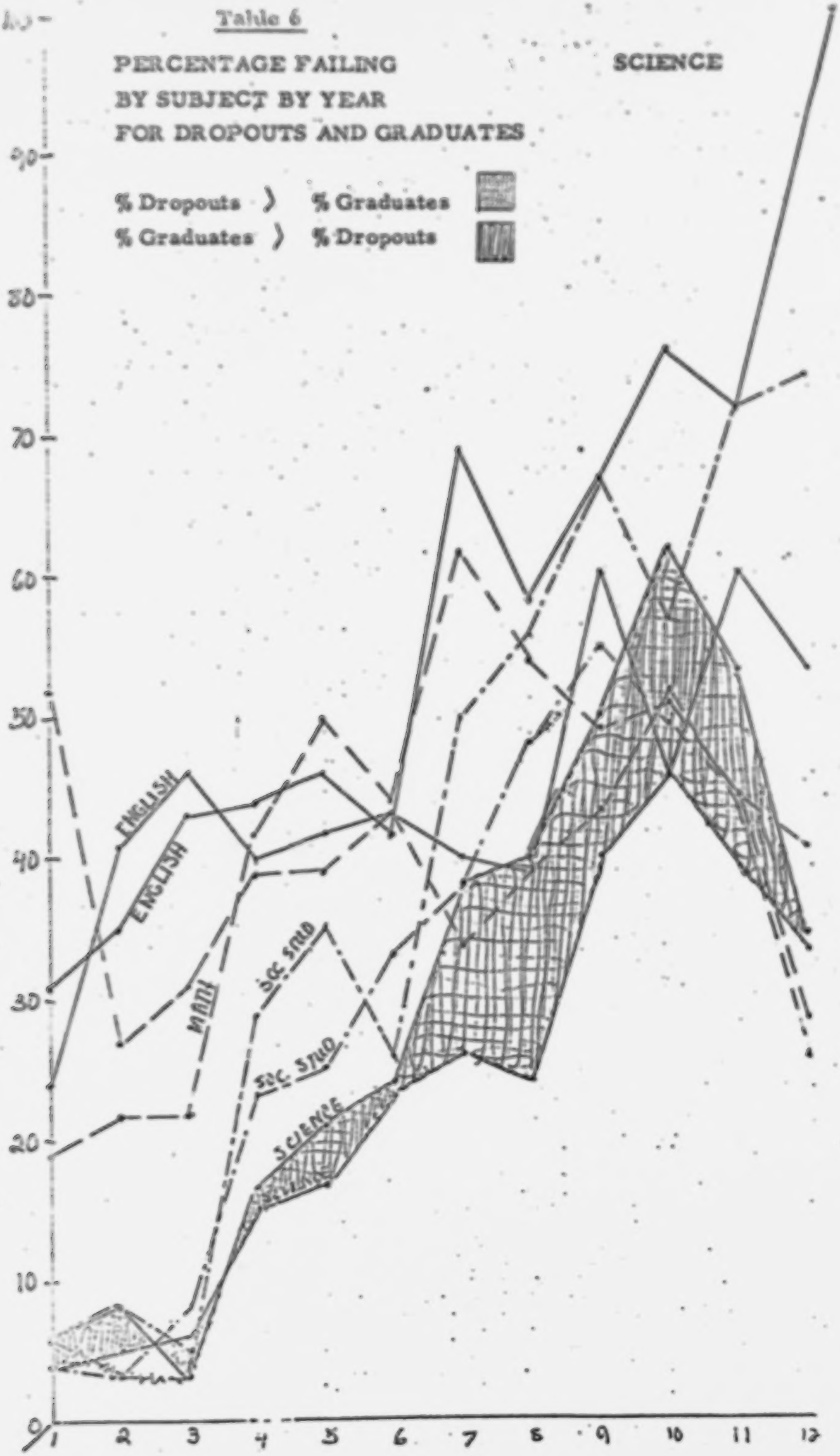


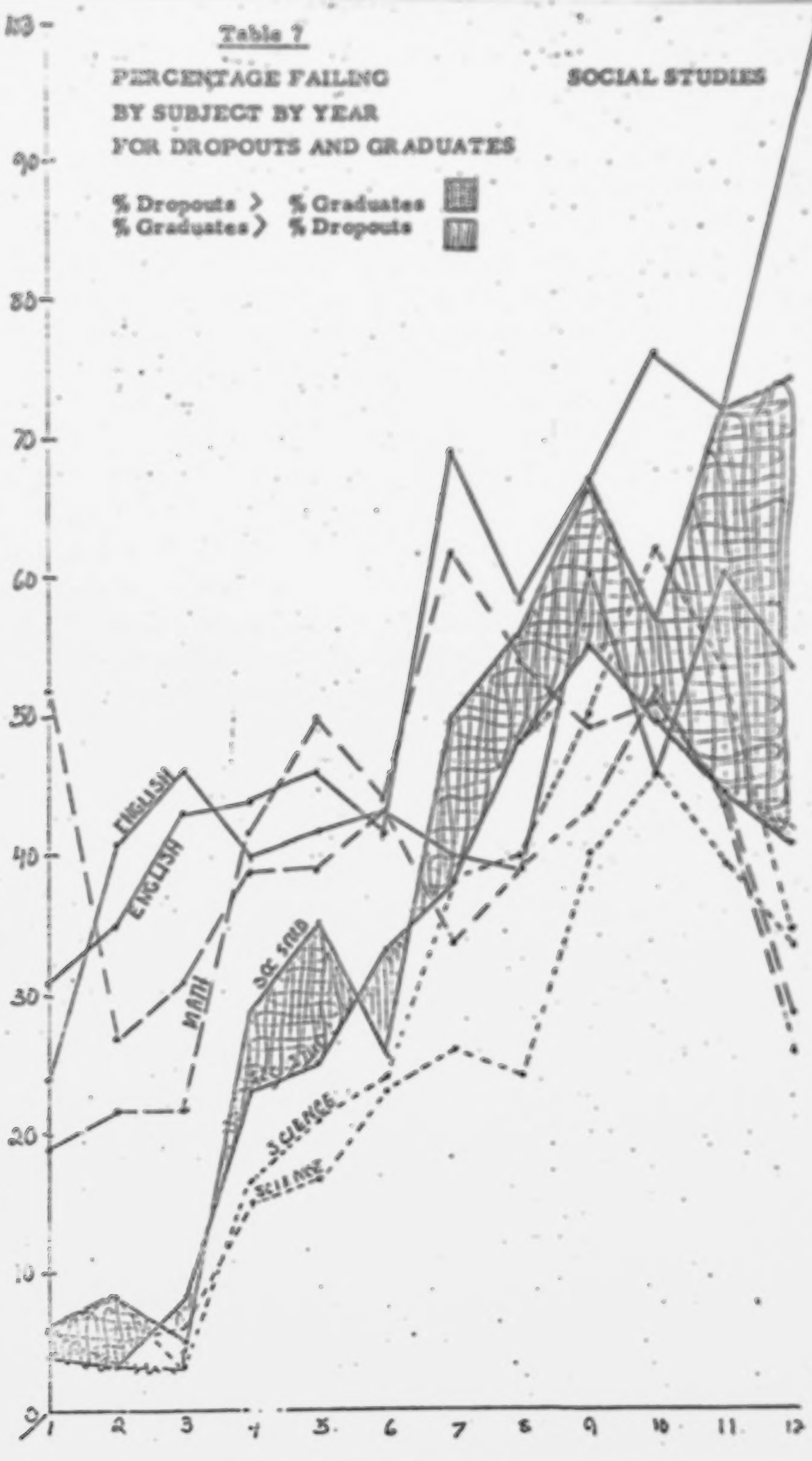
Table 7

PERCENTAGE FAILING BY SUBJECT BY YEAR FOR DROPOUTS AND GRADUATES

SOCIAL STUDIES

% Dropouts > % Graduates

% Graduates > % Dropouts



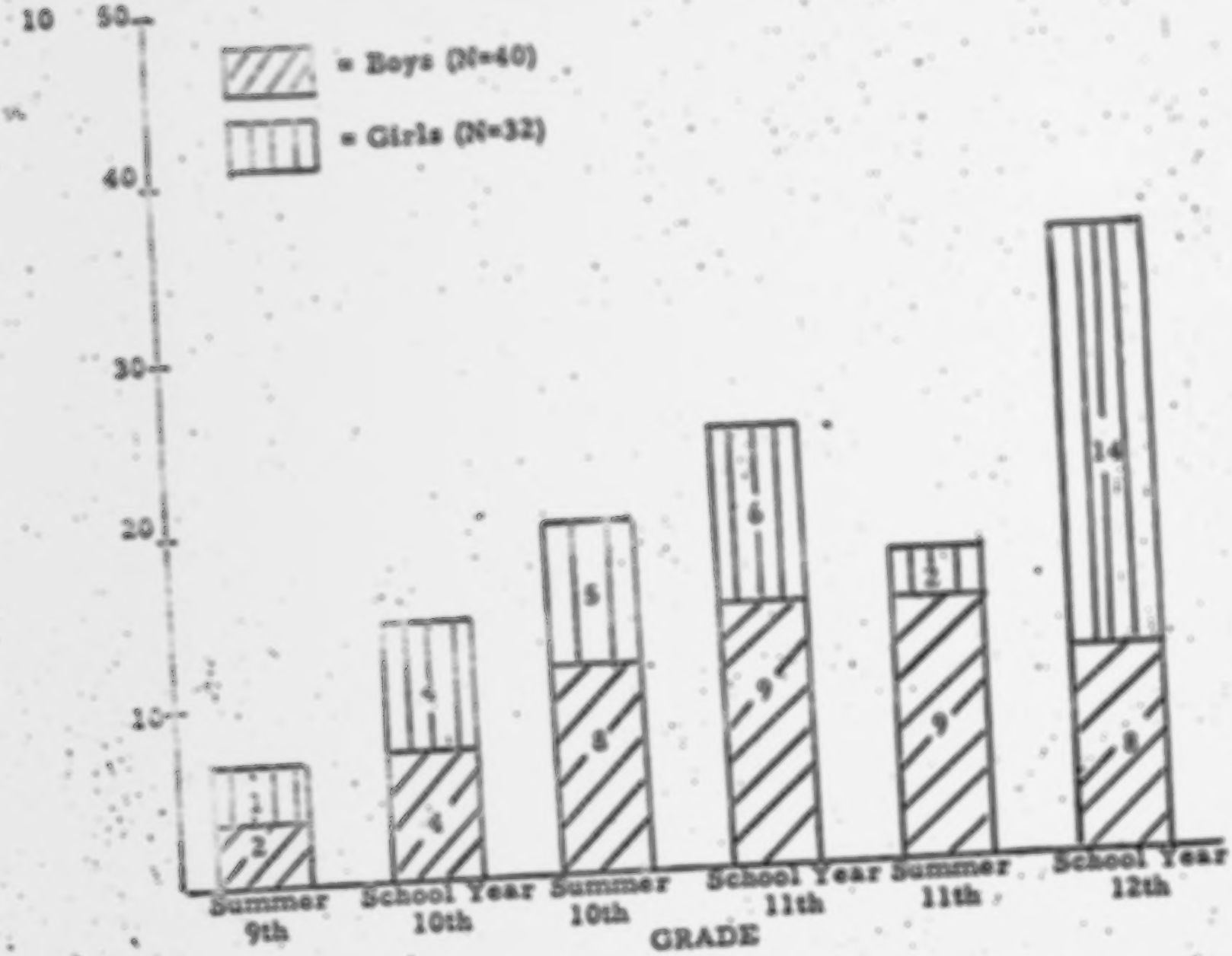
In what grade do dropouts leave school? Out of 220 students in the sample, 72 dropped out for various reasons. The majority of dropouts (56%) were boys. A general overview of the dropout rate in this sample indicates a fairly even attrition rate (see Table 9): 29% in the 10th grade; 36% in the 11th grade; and 31% in the 12th grade. (The 4% dropout figure in the 9th grade is disregarded here because few 9th grade students are old enough to drop out in accordance with the law.) However, such an overview hides some interesting distinctions between boys and girls and their time patterns. Some interesting differences are shown when the sample is disaggregated by sex and by grade of dropout.

For boys, an important trend was noted: the trend for boys was to drop out at a fairly even rate from 10th grade through the 12th grade. Thus, by the 12th grade, few boys were left to drop out. In contrast, the girls' dropout rate was much more varied during the four periods, with a low of 3% occurring in the 11th grade summer, and a high of 20% during the 12th grade school year.

The reasons given for dropping out in some of the records may help explain this. Boys were most likely to drop out because of an alleged lack of interest in school, and a desire to work. Girls, by contrast, frequently left for sudden personal reasons such as marriage or illness, which occurred during the school year. Among these dropouts, girls were more inclined to stay in school. Thus, after finishing the 11th grade, more than four times as many boys as girls had dropped out, but once the 12th grade school year had begun, almost twice as many girls had reasons to drop out.

TABLE 9

Density of Dropouts Among Boys and Girls for Grades 9-12



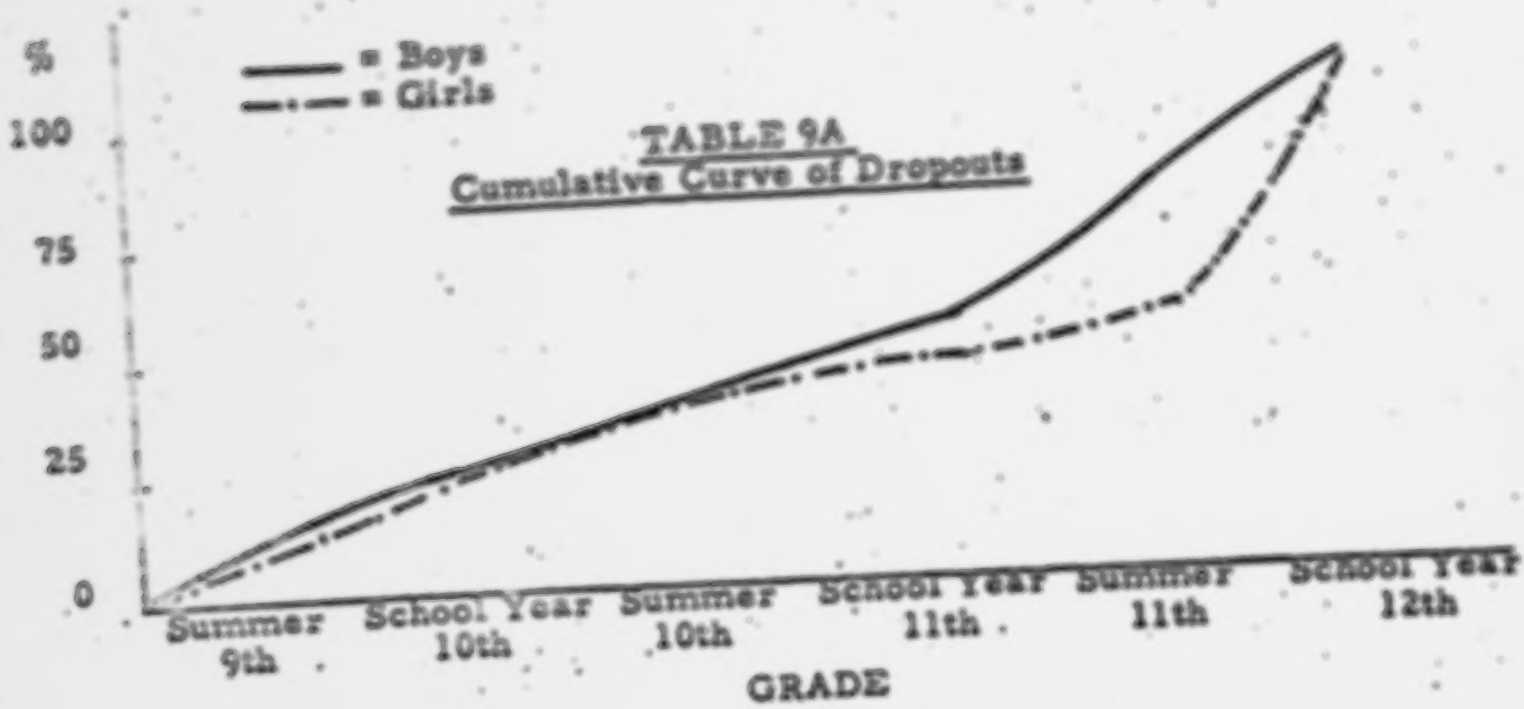


TABLE 9A
Cumulative Curve of Dropouts

What are the interrelationships between early performance and mid-point performance?

It seems reasonable to assume that if a child performs poorly early in his academic career, his failures there may contribute to later difficulty in other subjects which require similar skills. For example, poor reading ability which is first recorded in elementary school English may later contribute to failure in Social Studies where Reading is also required. It seems useful, however, to study first the relationships between early failure and mid-point failure (rather than failures as late as the 12th grade), for there may be important relationships which are lost in the longer-range comparisons. In addition, data at the 9th grade level were more uniform since all students were required to take English, Mathematics, Science and Social Studies in junior high school.

In light of the data available, it was decided that the Chi square (χ^2) test for two independent samples[9] provides an appropriate technique to examine this hypothesis. A variety of early and mid-point performance patterns were compared in this manner.

It already is evident that the areas of greatest interest for early year failures include English and Math. Later failures in all areas were worth exploring. The following Chi square values were obtained.[10]

Table 10

Chi Square Values for Early to Mid-point Performance

Early Performance	Mid-point Performance	χ^2
Reading	Social Studies	8.14**
Reading	Science	5.34*
Reading	Mathematics	1.04
Oral/Written	Social Studies	2.37
Oral/Written	Science	2.86
Oral/Written	Mathematics	3.38
Mathematics	Social Studies	.95
Mathematics	Science	2.67**
Mathematics	English	13.00

*Significant at the .05 level of confidence for 1 degree of freedom

**Significant at the .01 level of confidence for 1 degree of freedom

[9] $$\chi^2 = \frac{N(AD-BC-\frac{N}{2})^2}{(A+B)(C+D)(A+C)(B+D)}$$

See Siegel, S., Non-Parametric Statistics, New York, McGraw Hill, 1956, p. 107.

[10] See also Table 11.

Early performance in Reading showed a significant relationship to later performance in both Social Studies and Science; similarly, early performance in Mathematics related significantly to later performance in 9th grade English. Analysis of the actual distributions of these individual groups was necessary in order to interpret the reason for this significance.

Visual inspection of the data suggests that failure to pass Reading in the 4th grade corresponds significantly to future failure in Scial Studies; however, passing Reading in the 4th grade is no guarantee of later passing of Social Studies courses. In short, poor Reading may provide a real barrier to Social Studies proficiency, but the presence of early Rading ability does not forecast later Social Studies success.

Turning to the question of the relationship between 4th grade reading and later performance in Science, inspection of the distribution suggests that failure to pass English corresponded to later failure in Sience, but again passing English was not a guarantee of later passing Science courses. Interestingly enough, failure to pass Reading did not seem to assure failure in Science, as much as passing English related to passing Science. Thus, relative to Science, there was a premium on passing Reading but less concern about failing it.

Finally, early Mathematics performance showed a higly significant relationship with later English performance. Very few objects (27 versus 35) failed early Mathematics and later passed Engish. However, passing Mathematics, again, was no assurance of passing English. (See Table 11) This finding was examined in light of the correspondence of early Reading to later English. A Chi Square analysis of 17.34 (significant at the .01 level)suggests that the correspondence of early Mathematics to later English is more a function of grading pocedures than of subject-grade inter-dependency.

What are the interrelationships between mid-point single nd multiple subject failures at the 7th grade level and later graduatio?

The second stage of analysis is concerned with how mid-point failures are related to graduation versus dropout among poorly performing students (see Table 11 for actual data). The seventh gade was chosen for two reasons. First, it is at this point that non-grduates seem to demonstrate increasing difficulty with their studies. Secod, it may still be possible to do something to avert future dropout if the problem

TABLE 11

X^2 Test of Early and Later Performance

4th Grade and 9th Grade Performance

9th Social Studies	Reading 4 P	Reading 4 F
P	70	37
F	74	84

$X^2 = 5.14^{**}$

9th Science	Reading 4 P	Reading 4 F
P	87	58
F	53	65

$X^2 = 5.34^{**}$

9th English	Math 4 P	Math 4 F
P	67	27
F	76	85

$X^2 = 13.00^{**}$

9th English	Reading 4 P	Reading 4 F
P	50	29
F	46	93

$X^2 = 17.43^{**}$

7th Grade Performance and Drop-out vs. Graduation

7th English	DO	GR
F	40	80
P	32	118

$X^2 = 4.31^{*}$

7th Math	DO	GR
F	45	68
P	27	130

$X^2 = 16.06^{**}$

7th Soc St.	DO	GR
F	36	76
P	36	122

$X^2 = 2.48$

7th Science	DO	GR
F	27	51
P	45	147

$X^2 = 3.00$

8th Soc St.	DO	GR
F	39	53
P	36	129

$X^2 = 11.12^{**}$

8th Math	DO	GR
F	36	52
P	43	133

$X^2 = 6.83^{*}$

8th Science	DO	GR
F	28	37
P	48	145

$X^2 = 6.90^{**}$

8th English	DO	GR
F	35	44
P	47	136

$X^2 = 10.70^{**}$

* = Significant at the .05 level of confidence

** = Significant at the .01 level of confidence

area is identified and dealt with. Chi square values were determined in the following areas (see Table 12) as they corresponded to dropout versus graduation.

Table 12

Chi-Square Values for the Performance of Dropouts Vs. Graduates On a Series of Single and Multiple 7th Grade Performance Measures

Early Performance	X^2
English	4.31*
Mathematics	16.06**
Social Studies	2.48
Science	3.00
English/Social Studies	11.12**
English/Mathematics	6.83**
English/Science	6.90**
English/Social Studies/ Mathematics	10.70**

*Significant at the .05 level of confidence for 1 degree of freedom

**Significant at the .01 level of confidence for 1 degree of freedom

Table 11 shows that performance in the 7th grade on a variety of measures bears a significant relationship to later graduation (or dropout). Inspection of the individual courses of English, Mathematics, and Social Studies reveals that failure in 7th grade Mathematics corresponds most significantly to drop-out at a later point in time. A significant number of dropouts failed this subject (62%), as contrasted with poorly performing students of whom only 34% failed to pass the course but still managed to graduate. The same was true of English, but the tendency was not as strong. Social Studies, and Science performance, however, failed to yield significant relationship with graduation.

Inspection of the relationship between multiple failures in the 7th grade with consequent graduation, not surprisingly, showed a highly significant pattern (all beyond the .01 level). However, inspection of the data indicates that this increased significance results in large part from the behavior of the graduates rather than that of dropouts; i.e., a large number of graduates failed to do poorly in two courses simultaneously.

Conversely, only about 50% of the dropouts did poorly in paired courses. This means that almost as many dropouts did "well" as did poorly (in the case of English and Science more did well), and yet still dropped out. Thus, the multiple "predictions" must be viewed with some skepticism. The same finding is true with respect to the combination of English, Mathematics and Social Studies. The source of significance is the disproportionate number of graduates who passed at least one of the subjects rather than a large number of dropouts who failed in all three subjects.

IV. SUMMARY, INTERPRETATIONS, AND TITLE ONE IMPLICATIONS

The majority of students who would do poorly in their high school careers could be identified early in elementary school. By the second grade, 50% had already experiencedtheir first failure; 75% by the 4th grade; and 90% by the 7th grade. The critical areas of initial difficulty were English and Mathematics.

Over 40% of the students showed a spread pattern, (initially failing in only one or two areas) indicating that many children give "early warning signs" of future academic problems in many areas. Not surprisingly, the majority of spreads began with English courses.

The distribution of failures over the years was fairly consistent. Beginning with an initial increase in failures in the first three years, the subject failures then showed a more gradual rise over the years, reaching a high point in the 9th and 10th grades. A comparison of dropouts with low achieving graduates suggests that these graduates tend to do somewhat better than dropouts; and that the dropouts tend to fall further and further behind after the 7th grade. Over the years, English was the most frequently failed subject, with Mathematics and Social Studies being the next most difficult areas. However, the finding that the onset of initial failures among dropouts is later than for poorly performing graduates suggests that factors other than low ability contribute to actual dropping out of school. While the pattern of performance for graduates and dropouts across the subjects and across years was similar, dropouts generally performed at a lower level.

Concerning the grade-subject interdependencies, it was found that the Reading performance in the 4th grade corresponded to performance in 9th grade English, Social Studies and Science; also, 4th grade Mathematics proved to correspond to 9th grade English. With respect to the relationship between 7th grade subject performance and ultimate graduation, English and Mathematics separately, as well as when combined with Social Studies and Science, showed significant correspondence to subsequent graduation or dropout.

These findings confirm some rather commonly held beliefs among educators. First, students having trouble in their high school academic performance frequently have had a history of performance problems. This problem frequently goes back to early elementary school. Furthermore, this study indicated that while early failures may appear in only one or two areas (e.g., English or Math subjects), many students (40% of this sample) will show a downstream spread of effects (e.g., to Social Studies and Sciences). Where many early failures existed, multiple failures tended to be continued. Most initial failures occurred in English or Math, but this may be in part an artifact of the grading system since Social Studies and Science were not objectively scored for the first three years. However, even when objectively scored, these subjects were only infrequently the source of initial failure.

English language development appears to be a focal point of academic failures throughout the scholastic career. For many years there has been a stress on the importance of verbal and reading-writing fluency. The findings of this study support the validity of the assumption that early, general communication skills are vital to consequent success in other academic areas such as social studies and sciences.

While early performance is an excellent indicator of academic difficulty it is not as good an indicator of a student's dropout potential. The findings of this study indicate that poorly performing graduates produce a majority of early failing grades, which is consistent with the currently held belief that dropouts do not come primarily from any "lower ability group". Many of the dropouts performed better than the poorly performing graduates in early years. Over 25% had no failures prior to the sixth grade. However, it should be remembered that dropouts are contrasted here to poorly performing graduates; not to the entire graduating class. Thus, it seems that consistent with the belief of many educators, ability alone cannot account for dropping out of school. Early assistance to poorly performing students may not, in this case, help students who will be dropping out of school, but it may increase the later performance of non-dropouts who are already doing poorly. It should be remembered, however, that by the seventh grade most students who will have difficulty in high school (dropouts included) will be having difficulty, and at this point academic assistance (plus other types) can be applied.

Given these considerations, the following points seem applicable to Title One program assistance:

1. Where students are found to be having difficulty with school during the first four grades, special remedial programs should be initiated to help improve the quality of their achievement.

2. Particular attention should be paid to the areas of English and Math failures not only to improve later performance in these areas, but to prevent a "spread" of performance difficulty to other areas.

3. Since in many cases dropouts fail to show performance difficulty in the first two or three years, such programs should be primarily directed toward improving quality of students' performance rather than toward increasing the quantity of graduates.

4. Where students show a reasonable performance pattern for the first few years, and then begin a sharp decline in performance, this should be taken as a warning sign of potential dropout. Assistance directed toward students at the seventh grade level should be concerned not only with quality improvement, but also with increasing the number of graduates. Therefore, three types of Title One assistance may be called for: academic assistance; in-school counselling assistance; and possible home visitation assistance (perhaps directed toward helping parents to provide better home atmosphere for study, and reinforcement of the child's improved performance where such occurs).